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The Responsible Use of Computers
Where Do We Draw the Line?

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Introduction

At the Forum's founding meeting, Joseph Weizenbaum sketched out the limits of responsible computer use in the following terms: one should not do things with computers that one could not accept responsibility for doing without computers. I should like to accept that as our motto, and yet at the same time I feel it to be insufficient. As I see it, we here in the Forum must construct a detailed and technically sound set of arguments which will enable us to assess individual concrete developments according to our own values and professional judgments.

I don't mean by this a set of rules permitting a sort of grading system (responsible/irresponsible); the assessment will always be a dynamic social process allowing, in the case of conflicts, scope for other viable alternatives. To ensure that this scope is utilized in accordance with our own particular views and values, it is up to us to provide a contribution to the discussion setting out these views.

In what follows I shall attempt to outline a number of points relating to the limits of responsible computer use. I shall distinguish here between several different categories: I see the technical limits of responsible computer use —*i.e.*, from the point of view of the profession itself—where computers are utilized as a result of misguided trust in the capabilities of computer programs. My aim here is to call into question the exaggerated claims of our particular field. I don't wish to merely generalize about computer errors which might be avoided with the help of an improved technology or methodology, but rather to draw attention to the fundamental limits of this field as suggested by our professional experience as computer scientists.

I see the human limits of responsible computer use —*i.e.*, from the point of view of human interaction—where computers are used as a result of the misguided equating of people with machines. The areas in question here are those in which human interaction is hindered as a result of people's being replaced by computer programs; in which human experience dwindles, human care ceases to exist and social networks are destroyed. We as computer scientists must reject any attempt to raise the computer to the level of man's "partner."

Finally, the ethical and political limits of computer application must be drawn where (to paraphrase Weizenbaum) the attempt is made to do things with computers that ought not be done without them. We cannot shirk responsibility for things that happen as a result of

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The Forum Informatiker für Frieden und Gesellshaftliche Verantwortung (FIFF) is the West German affiliate organization of CPSR (the name is the translation of Computer Professionals for Social Responsibility). Christiane Floyd was one of the founders of FIFF, and has served as its chairperson .

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our computer programs. The use of computers has made it possible to split our sense of responsibility to a greater extent than has previously been the case with other complex technological applications. Between the preplanning (programming) of events and courses of action and their occurrence, the computer has now been interpolated as a non-human element. Nevertheless, the responsibility for what computers "do" still rests with the people who produce and program them, who plan and govern their application; which means that we bear this responsibility too.

In the following pages, I shall be using general principles to examine these limits in greater detail. In our work in the Forum they can be used primarily to throw critical light on questionable developments in the military sector. But our responsibility does not end there: we must help to lay down the limits of responsible computer use in all areas of society. My main concern, though, is that we use this discussion in the Forum to encourage a process of rethinking among computer scientists, each of us in our own particular sphere of work and in accordance with our own responsibilities, so as to enable us, through our combines efforts, to lay the professional foundations for a computer science more closely geared to human values.

Technical Limits of Responsible Computer Use

Although, in my view, this question requires highly detailed argumentation, the present paper can represent no more than a tentative attempt at coming to terms with the issue. I hold that the limits described below are inherent in the nature of our work, in other words they may be shifted by technological and methodological improvements, but never eliminated altogether.

All models of reality anchored in a program are, by their very nature, reductionist. This means that in specifying or implementing programs we are always forced to model reality in all its diversity using a finite number of selected objects (or classes of objects), their selected but henceforth fixed characteristics, as well as the operations permitted on these objects. In so doing, we always create an artificial, closed microcosm which alone is decisive for the functioning of the program. In reality, we must always be prepared for unforeseen events or objects with new characteristics; the limit imposed by this process of modelling with the help of programs is intrinsically insurmountable.

The intelligence anchored in a computer differs fundamentally from human intelligence in the following respects: it always relies on a model which is based on fixed rules (in some cases with additional rules for expanding these dynamically). Human intelligence, on the other hand, incorporates as essential elements an appreciation of the situation in hand, together with past experiences relating to it, and experienced needs and values. Artificial intelligence is not rooted in the senses and the body, and therefore lacks the association with feeling and acting—for us ever present and taken for granted—an association without which reality is devoid of human intelligence.

Decisions on the basis of program results should therefore not be taken by other programs unless it is ensured that human beings with sufficient competence for taking these decisions are able to intervene as the responsible parties in the decision-making process. Only human beings can assess results and fit them meaningfully into the ever-changing interpretational context which itself emerges as a result of human communication.

We shall never succeed in totally eliminating program errors because to err is human. But erring is not only a human weakness, it is also a human strength, being as it is so closely bound up with the capacity for learning and finding unconventional solutions. Any given program can be no more than the result of limited human insight at a given point in time. We all know that errors in programs may have a wide variety of causes: insufficient understanding of the problem at hand, inadequate communication, equivocal agreements, ignorance of the actual application context of programs, insufficient knowledge about the available resources, errors in reasoning, carelessness, lack of or difference in motivation. We shall not be able to eliminate a single one of these by improvements in technology or methodology. Program errors, then, lay down one intrinsic limit of computer application: in other words, computers can only be used responsibly where the possibility of locating and eliminating program errors exist.

I see one intrinsic limit of responsible computer application in the lack of transparency of large program systems—not that I claim to be able to specify the maximum acceptable size of such systems—and the consequent impossibility of tracing the causes of located errors and reliably eliminating them in time. I do not consider this limit to be surmountable by improving specification, programming, or documentation methods; instead, it requires a conscious confinement to small, loosely inter-connected program systems separated by human beings acting in an interpretative and evaluative capacity who are familiar with the functioning of the sufficiently small programs and in a position to alter these, should an error occur, or compensate for it by manual circumvention of the program.

It is imperative that programs are made to fit the actual demands of the application context by trial operation under real conditions and subsequent adaptation. I do not simply mean by this the elimination of program errors in accordance with a given specification, but rather the interplay between the program and the technical or social system surrounding it. Particularly in the case of the increasingly common embedded systems, the desired functionality of programs cannot be established unequivocally and context-free; instead, the proper functioning of the program can only be understood in the context of the surrounding system. Where a trial in this context under real conditions is not feasible, it is not possible to assess the adequacy of the programs either; it is therefore irresponsible to make human beings dependent on the functioning of such programs when important issues are at stake.

Finally, I see one intrinsic limit of responsible computer application in the susceptibility to error and failure inherent in computer operation. No matter what organizational measures we may take, we shall not be able to eliminate the possibility of machines operating defectively at some time or other; of programs being erroneously fed the wrong data; or even of correctly functioning, and for their application context quite adequate programs producing incorrect results owing to other unforseeable events. In the last analysis, only human beings are capable, through assessment of the overall situation on the basis of numerous individual and differing perceptions, of distinguishing between real events and those merely simulated with the help of data and without any real background.

Human Limits of Responsible Computer Use

What I have to say here appears to me to be self-evident; however, in view of current developments in computer application in our society, I feel it necessary to state the obvious.

When using computers, the actions of computation, data processing and symbol manipulation are severed from all other ways of dealing with reality available to man, and are alone effective. In my view this is only defensible if:

- computers are used in applications where computation and symbol manipulation are adequate ways of dealing with reality;
- there remains sufficient scope outside the computer application for other human faculties and forms of experience not to degenerate.

In current practice these two points are, in my view, given no or far too little consideration. And, in this respect, computer science relies on kindred mechanistic theories in the humanities which, following the procedures adopted in the natural sciences, attempt to analyse our inner world in terms of clearly demarcated sub-areas. This is done by confinement, for example, to statements about the cognitive faculties of man in order to obtain concrete results. It is not my intention here to question whether a separative consideration of this sort is scientifically meaningful; but I feel it essential to stress that it does not follow from this separative approach in scientific consideration that these areas may ever be separated in reality too.

We as human beings alternate between mental states in which we compute, feel, process information, remember or dream, skipping back and forth at any time with such facility that we are scarcely aware of it. Computer science, on the other hand, nurtures, in my view, an image of man in which the diversity of human experience and action is reduced to information processing in the technical sense and to symbolic object manipulation. Here, I regard the following points as particularly problematic:

- the postulated structural similarity of man and computer as information-processing systems;
- the consequent view that human problem-solving behavior is governed by rules and is therefore classifiable and predictable;
- the already mentioned assumption that it is possible to disregard an essential and ever-present feature of man's mental make-up, *i.e.*, that his faculties of computation and symbol manipulation are inextricably linked with other forms of experience, such as feeling or acting, which are governed both by the connection between the mind and body and by the circumstances relating to the particular unique situation in hand and to its interpretation by the experiencing human being.

At this point I do not wish to go further into rival theories in the humanities in which other views of man are opposed to the mechanistic one; nor do I wish to examine the empirical evidence for or against the mechanistic view of man. But I do emphatically desire to disassociate myself from this view as the sole basis for the design and application of computer-aided systems since it conflicts with my experience of myself and in dealings with other human beings in a number of essential points; and, what is more, it threatens certain qualities in interpersonal relations which are for me indispensable.

I also feel that we must draw the limits of responsible computer use by consciously adapting a richer view of man and using this as the basis for our work. This involves both examining theories about man which conflict with the mechanistic view, and also—and this is of particular importance—recognizing the difference between man and machine in our own experience and in our relation with other human beings, so as to embody it.

The points mentioned above appear to me to be of significance for a number of specific concrete developments in computer science and computer application of which the following may stand as examples:
The area of human-machine interaction. Here, we must make it clear that between human beings and machines there can be no communication in the proper sense of the word, and no dialogue can be carried on; that the computer will never be man's partner; and that we must therefore ensure that communication, dialogue and partner-like cooperation between human beings remains possible in jobs involving work at computer terminals.

Changes in work processes through computer application. We must see to it that the role of human beings in computer aided systems does not degenerate into meaningless routine work and computer operation, but rather that meaningful human activities are adequately supported by the computer.

The use of computers in areas where interpersonal relations are of paramount importance. Here, we must insist, for example, that the human relationship between teacher and student cannot be replaced by computer-aided instruction; that human care for the elderly cannot be substituted by the use of geriatric robots, as proposed by certain computer scientists; that jurisdiction is more than information processing with reference to the particular case in hand and the relevant laws; that the assessment of colleagues' achievements cannot be reduced to the numerical evaluation of selected performance characteristics.

The invasion of leisure time and family life by the computer. Here we are quite justified in posing the question as to what extent the continued and one-sided preoccupation with computers allows other human capabilities, which are thereby neglected, the chance of developing harmoniously.

The drawing of a line between man and machine is not, in the last analysis, imposed from without, but is rather inherent in man as a thinking and acting being in who, machine-like and non-machine-like elements interact. Through our constant confrontation with the computer we risk being encouraged to think and act more like machines, our other faculties going to waste. If we wish to avert the negative effects of the computer on our environment, we must first of all come to terms with the machine in our own selves.

Ethical and Political Limits of Responsible Computer Use

Wherever computers are used there is a danger of their being utilized to promote the interests of individuals or specific groups in order to do things with computers that ought not to be done without them. I shall therefore not attempt to survey the areas which are particularly at risk, but rather outline the ways in which computers may be used to circumvent accepted ethical or political limits.

- With the help of computers the attempt can be made to conceal measures whose open application would be impossible on the basis of currently accepted values and legislation. Instances of such utilization are the surveillance and control of the individual by the state and private organizations and enterprises.

- With the help of computers one can set out to circumvent ethical action—which is exclusive to man—so as to force preplanned events to occur contrary to man's sense of responsibility. This is evidenced, for example, by considerations as to the necessity of triggering off the destruction of a city (in the case of a nuclear war) by means of a computer on the grounds that human beings would probably be unwilling, even under stress and acting under orders, to carry out a command of this sort.

- With the help of computers one can attempt to shirk responsibility for the occurrence of programmed events by delegating the responsibility to the machine. Although the computer stands as a nonhuman element between programming and execution, the responsibility for the effects of applying our programs rests with us as human beings.

- Finally, one can with the help of computers set out to exceed the limits of human responsibility altogether. More specifically, we are today in the process of planning the application of programs which would be capable, on occurrence of a local problem, of wiping out, without human intervention, all life on this planet.

Gunther Anders defines the permissible limits for human products as follows: "Man, being as he is at liberty to produce things, probably has no criterion of this sort to go by: that is, unless he takes himself as criterion; in other words, defines the limit as being reached at the point where, being, so to speak 'smaller than himself,' he 'cannot keep up with himself,' *i.e.*, can no longer cope with his own products. As is the case today." (Excerpt from "Die Antiquiertheit des Menschen," Vol. 1, *Uber die Seele im Zeitalter der zweiten industriellen Revolution*, C.H. Beck, Munich 1980, p. 45.) ☐